

ALTERNATIVE FUMIGANTS AND GRAFTING FOR TOMATO AND DOUBLE-CROPPED MUSKMELON PRODUCTION IN FLORIDA

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A field trial was conducted at the USDA, ARS Farm in Fort Pierce, FL, in a field infested with root-knot nematodes (RKN) (*Meloidogyne incognita*), soilborne pathogens, and weeds. A split plot experiment with four replications was used to evaluate rootstock/scion combinations in fumigated and herbicide-only treated soil. Four main plot soil treatments were applied under metalized film (Canslit, Inc.) and were methyl bromide (200 lbs/a, 67:33 mebr:chloropicrin), iodomethane (100 lbs/a, 50:50 iodomethane:chloropicrin, Midas®, Arysta LifeScience Corp.), dimethyl disulfide (50 gal/a, 79:21 DMDS:chloropicrin, Paladin™ + chloropicrin, United Phosphorous, Inc.), and an herbicide-only control (Dual Magnum™, Syngenta Crop Protection; Matrix®, DuPont; and Sandea®, Gowen Co.). Subplot treatments in the primary tomato (*Solanum esculentum*) crop consisted of three rootstocks reported to be resistant to RKN ('TX301' (Syngenta Seeds), 'Multifort' (De Ruiter Seeds), and 'Aloha' (American Takii)), and the non-grafted scion, 'Florida-47' (Asgrow Seed) on its own rootstock. Main plots were 100-foot long and were split into 25-foot subplots for each tomato rootstock, which were planted in September 2007, and harvested in December 2007. A double-crop of muskmelon (*Cucumis melo*) was planted into the existing beds in the March 2008 and harvested in June 2008. Two muskmelon rootstocks (*C. metulifer* (Trade Wind Fruit Co.) and 'Tetsukabuto' (Takaii Seed, Salinas CA, F1- *Cucurbita maxima* x *C. moschata*) were evaluated with the non-grafted scion 'Athena' (Syngenta Seed) on its own rootstock. Three melon plants of each rootstock were planted into subplots previously occupied by each of the four tomato rootstocks. Both crops were managed using recommended commercial practices for Florida tomato and muskmelon production, and were evaluated for plant growth, disease and nematode resistance, yield, and graded fruit. Weed populations were assessed for fumigant treatments at planting, mid-season, and harvest. Data included species composition, density, and weight.

There were no differences among soil treatments for effects on RKN populations early in the season. By late season, however, soil counts were higher in the herbicide-only plots, and RKN populations extracted from tomato roots following harvest were significantly higher/g root tissue in the herbicide-only plots. Non-grafted rootstocks supported higher populations of RKN in soil and roots at the end of the season than all other rootstocks. Interactions occurred between soil treatments and rootstocks with regard to galling by RKN. The most root galling occurred in herbicide-only soil and in subplots containing non-grafted plants.

‘Multifort’ and ‘Aloha’ provided the best resistance to galling in herbicide-only treated soil of the rootstocks tested. No differences in galling occurred among rootstocks in soil treated with methyl bromide, methyl iodide, or DMDS.

Soil treatments did not affect tomato plant vigor early in the season, but by midseason, methyl bromide had higher vigor than to all other soil treatments. Late in the season, methyl bromide was only different from the herbicide-only control with respect to plant vigor. All soil treatments increased plant height, shoot weight, and root weight at mid- and late season compared to the herbicide-only control. ‘Aloha’ rootstock produced less vigorous plants at both mid- and late season than all other rootstocks. Plant height at midseason was lower for ‘Aloha’ and ‘TX301’ compared to the non-grafted controls. Sprouting from the rootstocks occurred in all grafted varieties but was less for ‘TX301’ and ‘Aloha’ than ‘Multifort’ which was grafted above the rootstock cotyledons. By late in the season ‘Multifort’ plants were taller than all other plant types. At the end of the season, ‘TX301’ and ‘Multifort’ had the highest shoot and root weights, and best root condition ratings of all plant types. Tomato yield was highly variable among main and sub-plot treatments with significant interactions which require further analysis. All soil treatments controlled weeds throughout the tomato crop.

The effects of soil treatments on nematodes and weeds were sustained in the melon double-crop. In February, all soil fumigants had lower RKN populations than the herbicide-only control, with methyl iodide having significantly lower numbers. By midseason of the melon crop, RKN populations had rebounded in all treatments. At the end of the melon crop only DMDS had lower numbers of RKN isolated from roots than the herbicide-only control. Of the rootstocks tested, *C. metulifer* supported lower RKN populations in both soil and roots at the end of the season than either the non-grafted control or ‘Tetsukabuto’. Previously planted tomato rootstock also had an effect on galling of melon with highest galling occurring following non-grafted tomato in all soil treatments. Weed populations remained low through the second crop and there were no differences between treatments until the melon harvest weed counts, at which time the herbicide-only treatment had the greatest number of weeds/plot. Although the number of weeds was significantly different, the populations were still minimal and there were no differences in either the fresh or dry biomass of weeds collected at melon harvest. There were no rootstock effects on weed populations for either tomato or melon. Melon vine growth measured in March was lower in the herbicide-only control than in all other soil treatments. Disregarding soil treatment, vine growth was greatest in *C. metulifer* and lowest in ‘Tetsukabuto’, with the non-grafted ‘Athena’ intermediate. All fumigants increased total fruit weight of melons compared to the herbicide-only treatment. Total fruit weight and fruit weight/plant were higher in *C. metulifer* and ‘Tetsukabuto’ compared to non-grafted melon. Previously planted tomato rootstock also had an effect on total fruit weight of melon with ‘Aloha’ increasing total fruit weight of melon compared to melons following non-grafted tomato.